

Conservation Strategy Option 3 - Dual Conveyance Facility

Initial working model operational parameters for BDCP Option 3¹ - Below Normal Water Year.

Option 3 Summary: The facilities alterations under this option would include those identified in Option 2, plus a new intake facility on the Sacramento River with a state-of-the-art positive barrier fish screen and isolated conveyance directly to SWP/CVP facilities in the south Delta. Existing pumping and intake facilities could still be operated in lieu of or in addition to the new facilities. Habitat restoration and enhance would be similar to that under Option 2. Fluctuating salinity conditions could also be implemented by operations of the new facilities. **Note:** need to add a gate at Franks Tract.

The range of operating parameters outlined below would be used depending on the location of diversions.

Part 1: SWP/CVP South Delta Pumping Facility Operations Criteria

Parameter	Range		Rationale
<i>Operational condition and seasonal time period used as a model input and/or output</i>	<i>A range of values for a given operational condition intended to reflect alternative hypotheses or interpretations of available data</i>		<i>The rationales generally reflect the intended result of the parameter</i>
Delta Salinity Standards	Manage to meet D-1641 agricultural water quality	Do not manage specifically to meet water quality standards – variable salinity	Meet water quality standards for CCWD (assumes CCWD diversions from Victoria Canal)

¹ These operational parameters have been developed by the SAIC team, which is providing support to the BDCP Steering Committee. They are intended to enable the SAIC team to undertake a coarse modeling of the different conservation strategy options now undergoing a comparative evaluation to assist the Steering Committee in narrowing down the options for purposes of furthering the planning process. They are not designed to, nor intended to, represent proposed operational parameters for the system by either the SAIC team or any entity on the Steering Committee, nor should they be misconstrued as such.

Sacramento River at Rio Vista			
Sept	3,000 cfs	4,500 cfs	Adult Chinook salmon attraction and migration flows
Oct	4,000 cfs	4,500 cfs	Adult Chinook salmon attraction and migration flows
Nov-Dec	4,500 cfs	4,500 cfs	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others
Jan	No criterion	4,500 cfs	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others
Feb-Jun	No criterion	No criterion	Evaluation parameter
Jul-Aug	No criterion	4,000 cfs	Steelhead and salmon rearing within the mainstem river; support resident fish habitat
San Joaquin River flow at Vernalis			
May	VAMP flow requirements	D-1641 flow requirements	The flow range was selected to reflect the current range of conditions intended to improve juvenile Chinook salmon emigration survival
Jul-Sep	No criterion	No criterion	Evaluation parameter
Oct	1,400 cfs	2,000 cfs	Attraction flows and improved water quality (DO and temperature) for adult salmon migration – equivalent to D-1641
Nov-Jan	D-1641 water quality requirements	1,500 cfs	Salmon fry rearing and dispersal, nutrient transport to Delta, splittail spawning and larval rearing and dispersal
Feb-Apr and Jun	D-1641 flow requirements of approximately 1,420 cfs	D-1641 flow requirements of approximately 2,280 cfs	D-1641 X ₂ contribution results in a range of San Joaquin River flows
X₂			
Feb-June	D-1641 X ₂ locations	66 km	The range of X ₂ locations during the late winter-spring is intended to reflect (1) the current regulatory requirements and (2) an expansion of low-salinity habitat further downstream within Suisun Bay (66 km)

Jul-Jan	No criterion	No criterion	Evaluation parameter
Total Delta Outflow	No criterion	No criterion	Evaluation parameter
Hydraulic Residence Time in Selected Delta Channels	No criterion	No criterion	Evaluation parameter
DCC			
Feb-Jun	Closed	Open	The range in DCC operations was intended to reflect (1) reduced movement of juvenile salmon and steelhead into the interior Delta; improved juvenile salmon survival, and (2), improved hydrodynamics for delta smelt within the central Delta and reduced vulnerability to SWP/CVP diversions
Jul-Jan	Open	Open	Improve hydrodynamics and water quality within the central Delta; reduce the potential barrier to fish movement into and out of the central Delta
SJRB – Installed in the San Joaquin River to direct fish and flows into Old River			
Mar-May	Closed	Closed	Reduce movement of juvenile salmon and steelhead into the southern Delta through the lower San Joaquin River and facilitate juvenile Chinook salmon passage into the central Delta through Old River; improve salmonid survival and reduce their vulnerability to SWP/CVP diversions
Jun-Aug	Closed	Closed	Increase flows and flushing within the southern and central Delta to improve water quality
Sep-Nov	Closed	Closed	Improve attraction flows and water quality for

			adult salmon within the lower San Joaquin River
Dec-Feb	Closed	Closed	Reduce movement of salmon fry into the southern Delta; improve salmonid survival and reduce their vulnerability to SWP/CVP diversions
Old River Flows			
Year-round	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	Reduce vulnerability of delta smelt and other species to SWP/CVP diversions by isolating Old River habitat from the hydraulic influence of the diversion facilities; increase hydraulic residence time in the Old River region to increase primary and secondary production and provide low velocity habitat for delta smelt and other fish species; operate the Old River siphon to allow salmon, other fish, nutrients, phytoplankton, and zooplankton produced in the San Joaquin River to flow into the central Delta
Middle River Flows			
Mar-May	No criterion	>-2,000 cfs	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) larval and juvenile delta smelt, splittail, Chinook salmon, steelhead, and other fish produced in the Mokelumne and Cosumnes rivers and east-side channels and sloughs; reduced reverse flows are intended to reduce vulnerability to entrainment and SWP/CVP diversion effects
Jun	No criterion	>-6,000 cfs	The range in Middle River flows reflects (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) most juvenile fish have grown to a size where swimming performance allows habitat selection or they have moved downstream into Suisun Bay and

			outside the area of influence; the majority of juvenile salmon and steelhead have emigrated from the Delta
Jul-Sep	No criterion	>-8,000 cfs	Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths. Most of the sensitive covered fish species are not present in the central and southern Delta during the summer and therefore have reduced vulnerability to SWP/CVP diversions
Oct-Nov	No criterion	>-4,000 cfs	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) adult Chinook salmon are migrating upstream into the Mokelumne and Cosumnes rivers; reduced reversed flows in Middle River are intended to reduce migration delays and improve hydrodynamic cues and attraction flows
Dec-Feb	No criterion	>-4,000 cfs	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) Chinook salmon fry and steelhead smolts are emigrating through the Delta from the Mokelumne and Cosumnes rivers; reduced reverse flows are intended to reduce vulnerability to diversion effects; early spawning fish have planktonic larval and juveniles within the central Delta that could be vulnerable to hydraulic entrainment within Middle River
QWEST			
Mar-May	No criterion	Net positive flows (no reverse flow)	The range in QWEST reflects two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) reduced QWEST is intended to result in

			reduced movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increased transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increased transport of zooplankton and nutrients downstream into Suisun Bay; reduced the vulnerability of fish to SWP/CVP diversions; reduced delays in downstream migration of juvenile salmon and other fish
Jun	No criterion	Net positive flows (no reverse flow)	The range in QWEST reflects two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) the densities of juvenile fish potentially affected by QWEST are reduced in the central Delta by June and therefore the potential benefit is reduced; reduced movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increased transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increased transport of zooplankton and nutrients downstream into Suisun Bay; reduced vulnerability of fish to SWP/CVP diversions; reduce potential delays in downstream migration of juvenile salmon and other fish
Jul-Nov	No criterion	Net positive flows (no reverse flow)	The range of QWEST values are intended to reflect two alternative hypotheses including (1) delta smelt and other fish have reached a size where swimming performance allows volitional habitat selection; many fish are located downstream in Suisun Bay and are not in the area affected by QWEST, and (2) reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions
Dec-Feb	No criterion	Net positive flows (no	Reduce the movement of adult delta smelt from the Sacramento River into the interior Delta

		reverse flow)	and thereby reduce their vulnerability to SWP/CVP diversions
SWP/CVP VAMP Operations			
April	No criterion	VAMP	The range of SWP/CVP diversions is intended to reflect (1) opportunistic diversions used as a model evaluation parameter, and (2) start of the peak period of juvenile salmon emigration through the Delta; larval stages of delta smelt, longfin smelt, splittail, and other fish are present in the Delta in relatively high densities and are vulnerable to diversion losses, VAMP diversion rates are intended to provide a higher level of protection from diversion related direct and indirect effects; extend the VAMP period to two months is intended to increase the seasonal period of protection
May	VAMP	VAMP	VAMP diversion rate reductions are intended to provide increased protection for juvenile salmon emigrating from the Mokelumne and Consumes rivers and other species; peak period of smolt migration occurs in May in many years; assumes for modeling that VAMP period is in May however the actual period may vary

Part 2: Isolated Export Facility Operations Criteria

Parameter	Range		Rationale
Delta Salinity Standards	Manage to D-1641 agricultural (e.g., Jersey Point) standards	Do not manage specifically to meet water quality standards – variable salinity	Evaluation parameter to assess the range of variable salinity conditions that could occur and assess changes in aquatic habitat conditions as well as impacts on other Delta uses
Sacramento River at Rio Vista			

Sept-Oct	4,000 cfs	5,000 cfs	Adult Chinook salmon attraction and migration flows – the range is based on
Nov-Dec	4,000cfs	5,000 cfs	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others - the range is based on Rio Vista flows from CALSIM for below normal and above normal water years
Jan-Jun	5,000 cfs	9,000cfs	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others - the range is based on Rio Vista flows from CALSIM for below normal and above normal water years
Jul-Aug	2,000 cfs	4,000 cfs	Steelhead and salmon rearing within the mainstem river; support resident fish habitat - the range is based on Rio Vista flows from CALSIM for below normal and above normal water years
San Joaquin River flow at Vernalis			
May	D-1641 flow requirements	D-1641 flow requirements	The available relationships show a positive response with increasing spring flows; flows for salmon migration; nutrient transport to Delta; juvenile splittail rearing and dispersal
Jul-Sep	No criterion	No criterion	Evaluation parameter
Oct	1,400 cfs	2,000 cfs	Attraction flows and improved water quality (DO and temperature) for adult salmon migration – equivalent to D-1641
Nov-Jan	D-1641 water quality requirements	1,500 cfs	Salmon fry rearing and dispersal, nutrient transport to Delta, Splittail spawning and larval rearing and dispersal
Feb-Apr and Jun	D-1641 flow requirements of approximately 1,420 cfs	D-1641 flow requirements of approximately 2,280 cfs	D-1641 X2 contribution results in a range of San Joaquin River flows
X₂			
Feb-June (assumes improved)	D-1641 X ₂ location	66 km	The range of X ₂ locations during the late winter-spring is intended to reflect (1) the current regulatory requirements and (2) an

habitat in central Delta)			expansion of low-salinity habitat further downstream within Suisun Bay (66 km)
Jul-Jan	No criterion	No criterion	Evaluation parameter
Total Delta Outflow	No criterion	No criterion	Evaluation parameter
Hydraulic Residence Time in Selected Delta Channels	No criterion	No criterion	Evaluation parameter
DCC			
Feb-Jun	Closed	Closed	Reduce movement of juvenile salmon and steelhead into the interior Delta; improve juvenile salmon survival by reducing vulnerability to in-Delta diversions,
Jul-Jan	Closed	Closed	Open as needed for water quality enhancement within the central and southern Delta
HORB –			
Year-round	Open	Open	Increase flows and flushing within the southern Delta to improve water quality
Old River Flows			
Year-round	No criterion	No criterion	Evaluation criteria
Middle River Flows			
Year-round	No criterion	No criterion	Evaluation criteria
QWEST			
Year-round	No criterion	No criterion	Evaluation criteria
SWP/CVP Diversions			
Mar-May	Not to exceed 15,400 cfs	Model output not to exceed 6,000 cfs	The range in diversion rates reflects (1) the location of the point of diversion is upstream of the primary habitat of delta smelt and therefore the risk of entrainment is low; the

			positive barrier fish screen is expected to be effective in excluding juvenile salmon and other fish from the diversion, and (2) a number of fish species spawn upstream of the point of diversion during the spring and have planktonic eggs and larvae that could be vulnerable to entrainment, reduce the diversion of nutrients and food supply for the Delta during the key spring months
Jun-Feb	Not to exceed 15,400 cfs	No criterion	Evaluation parameter

Assumptions:

- Water conveyance and south of Delta storage are assumed to not limit diversion operations– model evaluation parameter.
- Upstream reservoir storage and releases will be made in accordance with current requirements to support salmon and steelhead habitat and maintain suitable water temperatures and compliance with existing agreements and regulatory requirements including FERC conditions and ESA requirements.
- The barriers could be closed year-round, but may be periodically opened to promote flushing and improved water quality within the Old River region. The Old River regions of the Delta could function, as improved aquatic habitat while the Middle River region could serve as an in-Delta water conveyance facility. A siphon would be installed to allow water, fish, and nutrients produced in the San Joaquin River to flow out of Old River into the central Delta.
- Option 3 assumes that a dual conveyance system could be operated including
 - (1) Through-Delta conveyance in which SWP and CVP opportunistic export operations from the existing south Delta facilities. The Eco-Crescent of operable barriers could be installed to hydraulically isolate Old River from Middle River. The Old River regions of the Delta could function as improved aquatic habitat while the Middle River region could serve as an in-Delta water conveyance facility. A siphon would be installed to allow water, fish, and nutrients produced in the San Joaquin River to flow out of Old River into the central Delta.
 - (2) A completely isolated conveyance that assumes SWP and CVP export operations could occur exclusively from a state-of-the-art positive barrier fish screen located on the Sacramento River in the general vicinity of

Hood and isolated water conveyance canal with an Intertie to both the SWP and CVP export facilities in the south Delta. The existing south Delta export facilities could be used in conjunction with the isolated facility for water diversions from the Delta.

Under the assumptions used to evaluate Option 3 it has been assumed that the isolated conveyance facility could be preferentially operated at all times. The dual conveyance could be operated only when one or more of the operational parameters are controlling exports at the isolated facility (e.g., Rio Vista flows) and opportunities exist to supplement water exports by also operating the south Delta export facilities. For purposes of this assessment it has been assumed that the dual facility would be operated in accordance with both the Option 2 and Option 4 criteria depending on the export operations of both the isolated facility and/or south Delta exports. Water conveyance and south of Delta storage are assumed to not limit export operations under either the supply or environmental operations.